PACOM S&T Conference

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Assistant Secretary of Defense for
Research and Engineering (Acting)

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"Gentleman, we are out of money.

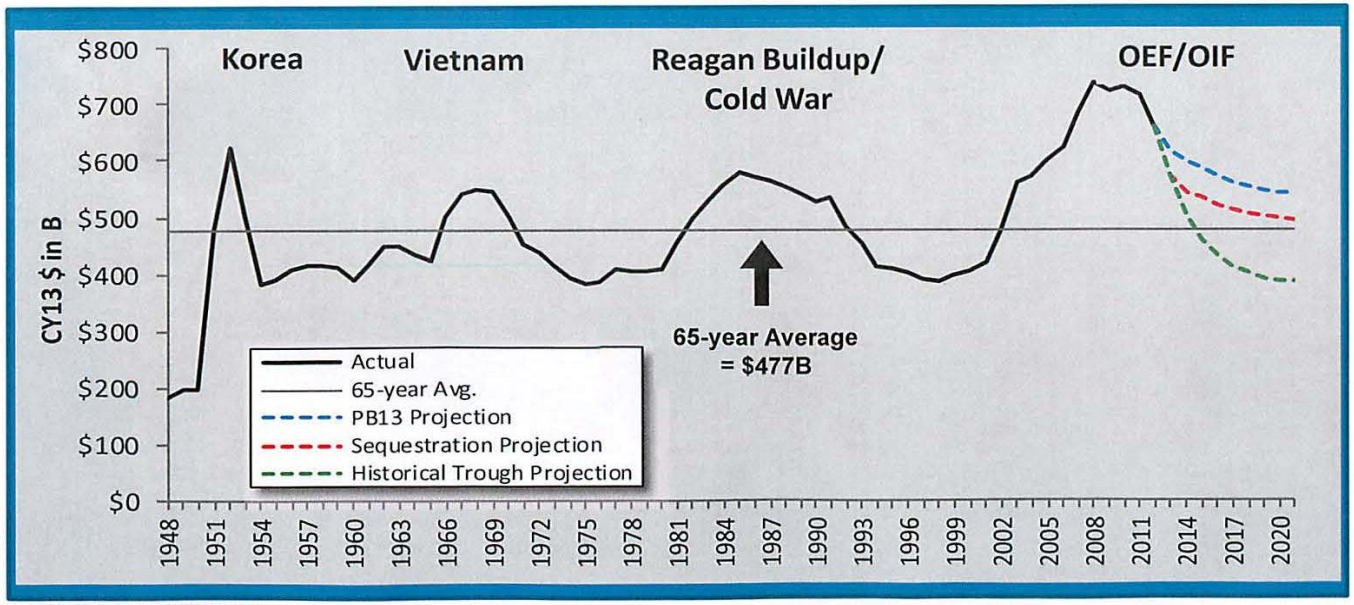
Now we must think!"

Winston Churchill to
Parliament during World War II

The Reality….

"Our current security challenges are more formidable and complex than those we faced in downturns following Korea, Vietnam, and the Cold War. There is no foreseeable "peace dividend" on our horizon."

GEN DEMPSEY, CJCS
Testimony to SASC, 12 Feb 2013



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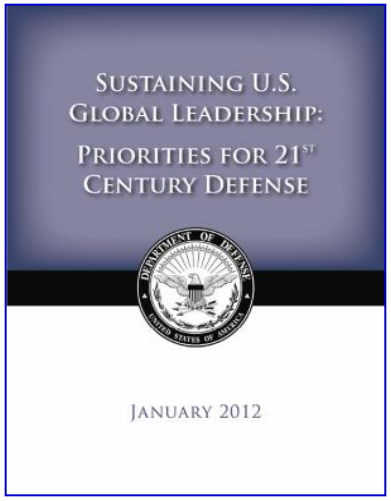
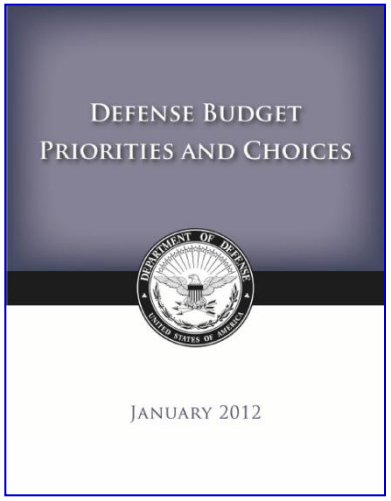
Key Elements of Defense Strategic Guidance



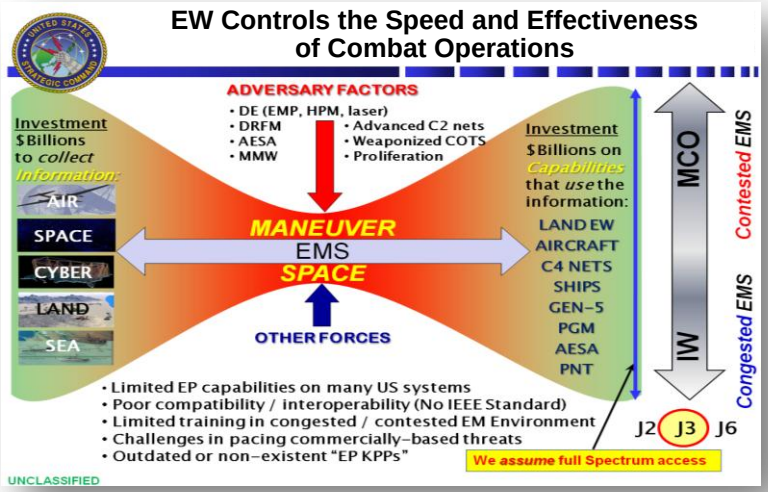


- **The military will be smaller and leaner, but it will be agile, flexible, ready and technologically advanced.**
- **Rebalance our global posture and presence to emphasize Asia-Pacific and the Middle East.**
- **Build innovative partnerships and strengthen key alliances and partnerships elsewhere in the world.**
- **Ensure that we can quickly confront and defeat aggression from any adversary – anytime, anywhere.**
- **Protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed.**

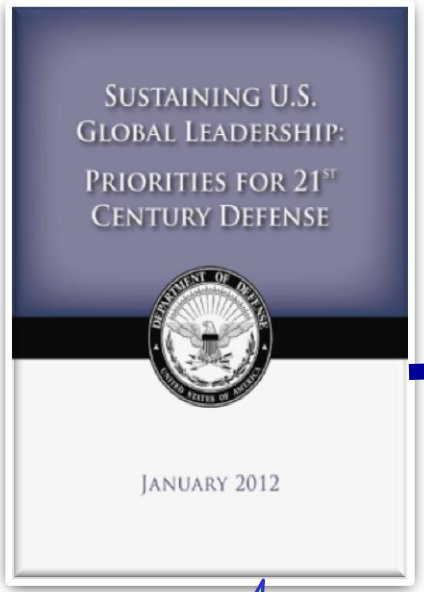
Defense S&T Drivers

In time of budget uncertainty, need to reevaluate the purpose of Defense S&T:

- **Mitigate emergent threats, e.g.**
  - Electronic Waarfare and Digital radio frequency memory (DRFM)
  - Missile defense
  - Cyber
- **Build / engineer affordability / interoperability in the acquisition chain**
  - Multi-service platforms pass data /info
  - Extend life and capabilities of existing systems
- **Create technology surprise, e.g.**
  - Quantum information systems
  - Synthetic biology, etc



Priorities for 21st Century Defense

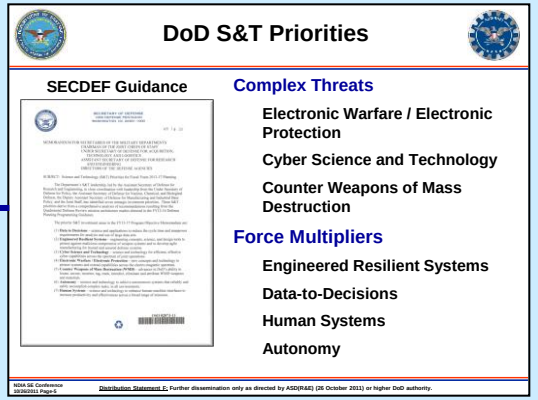


Missions in the Commons

Primary Missions of the U.S. Armed Forces

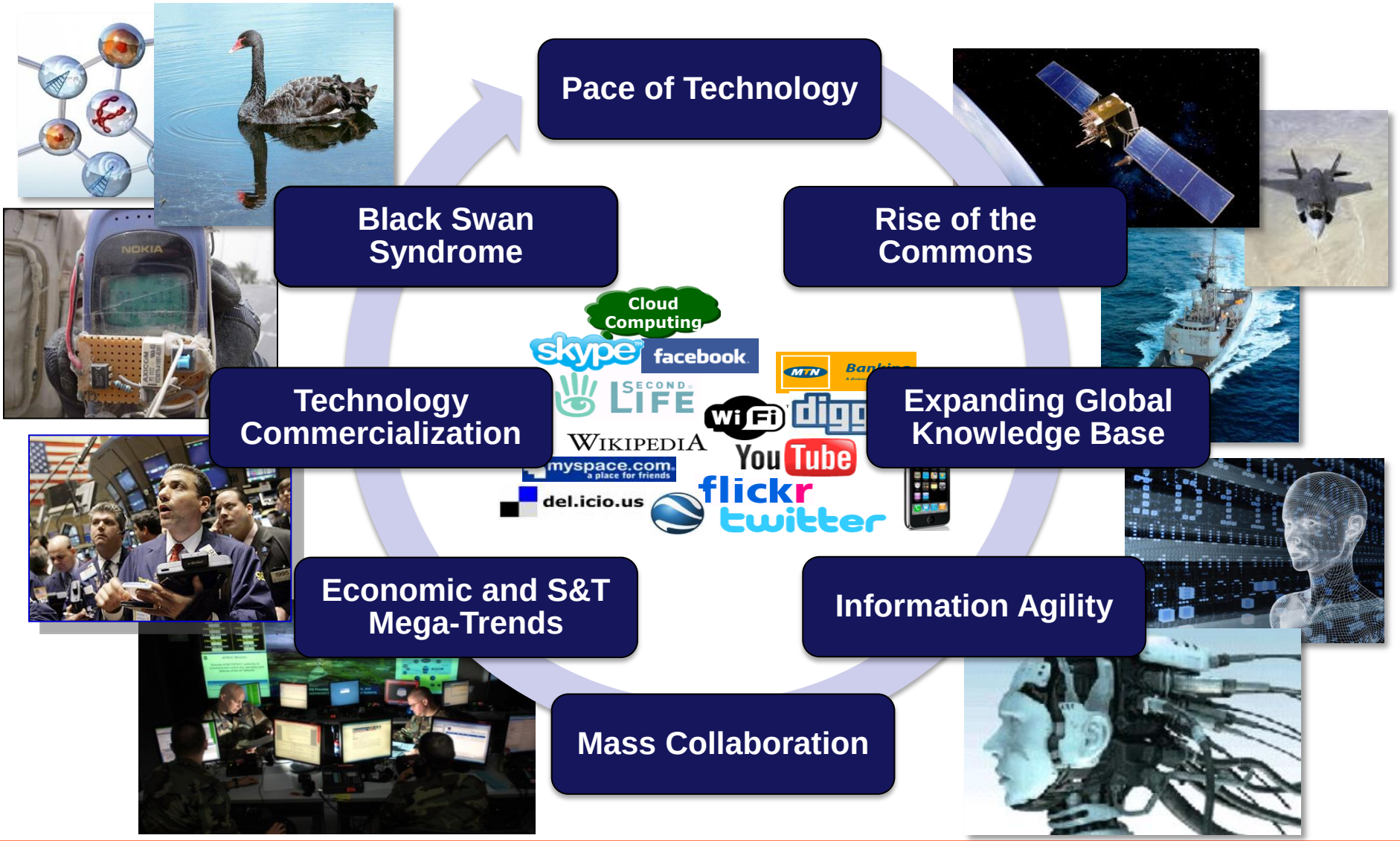
- Defend the Homeland and Provide Support to Civil Authorities
- Counter Terrorism and Irregular Warfare
- Conduct Stability and Counterinsurgency Operations
- Provide a Stabilizing Presence
- Deter and Defeat Aggression
- Project Power Despite Anti-Access / Area Denial Challenges
- Counter Weapons of Mass Destruction
- Operate Effectively in Cyberspace and Space
- Conduct Humanitarian, Disaster, Relief and Other Operations
- Maintain a Safe, Secure and Effective Nuclear Deterrent

S&T Focus Areas

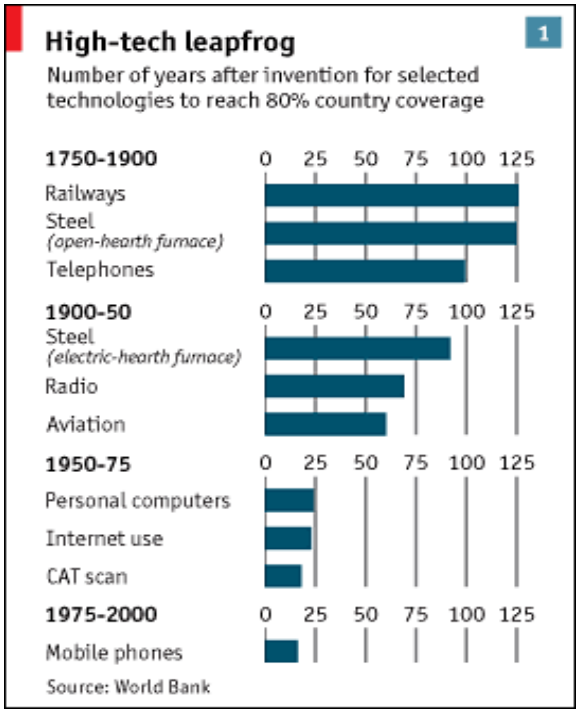


- Counter AA/AD capabilities
- Tailored and adaptive capabilities
- Low-cost, Small-footprint operations
- Developing and integrating partnership capabilities

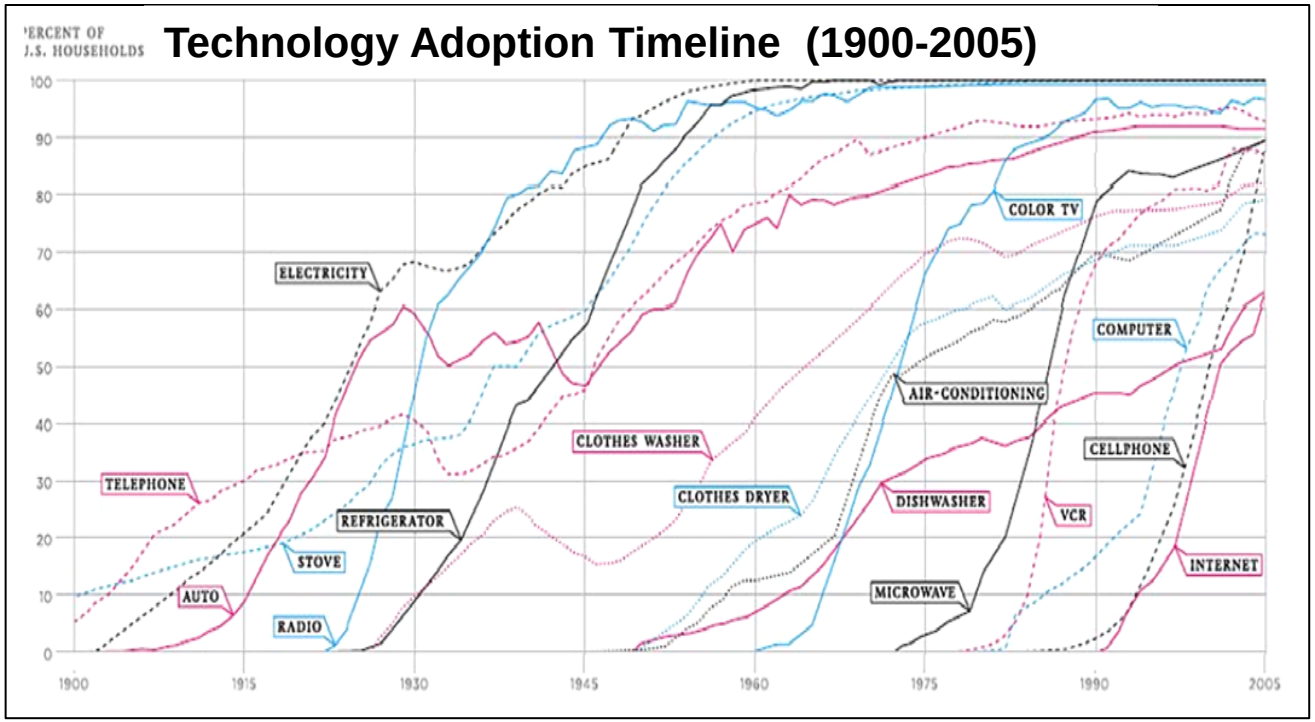
A New Reality:
Global Dimensions Affect DoD S&T



Pace of Technology



The Economist, Feb. 9, 2008



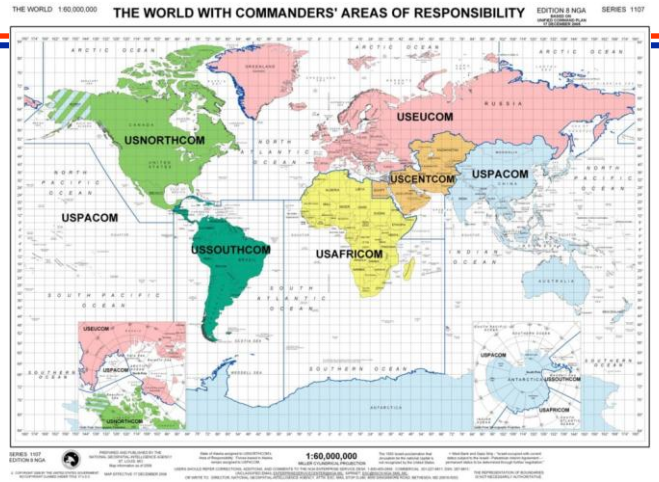
It took 23 years to go from modeling germanium semiconductor properties to a commercial product

The carbon nanotube was discovered in 1991; recognized as an excellent source of field-emitting electrons in 1995, and commercialized in 2000

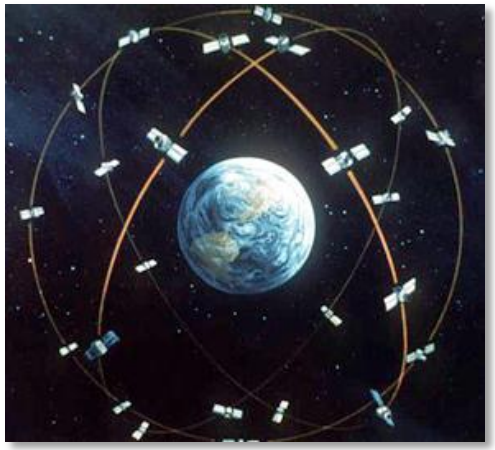
The Pace of Technology Development and Market Availability is Exceeding the Pace of Acquisition

Rise of the Commons

Electronic Warfare

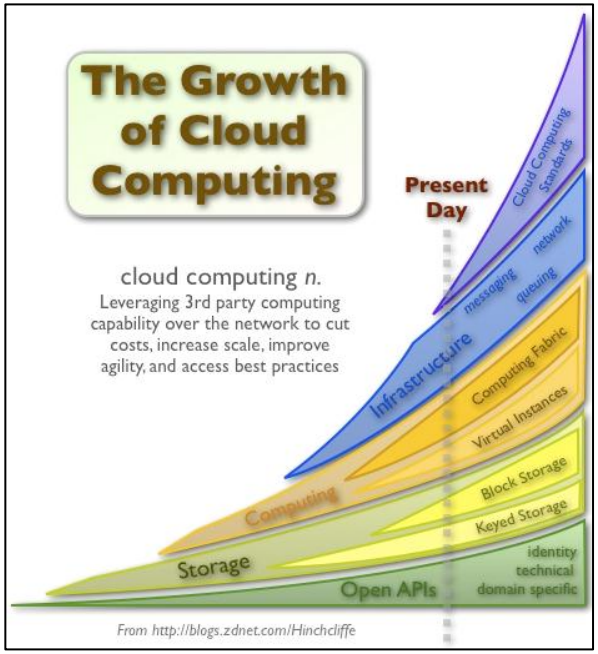


Oceans



Space

Cyber



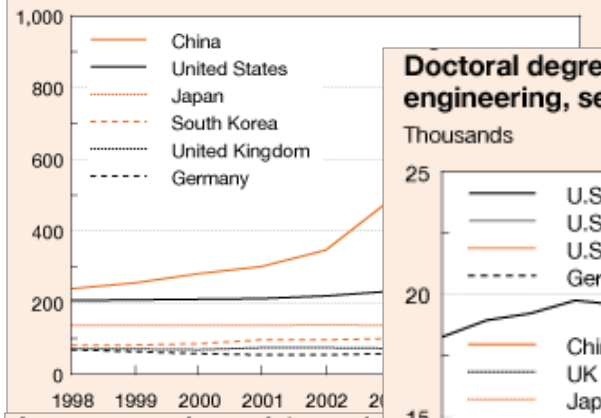
Ubiquitous Data

Military Operations Increasingly Depend on Being Able to Operate in Places "No One Owns" – *The Commons*

Expanding Global Knowledge Base

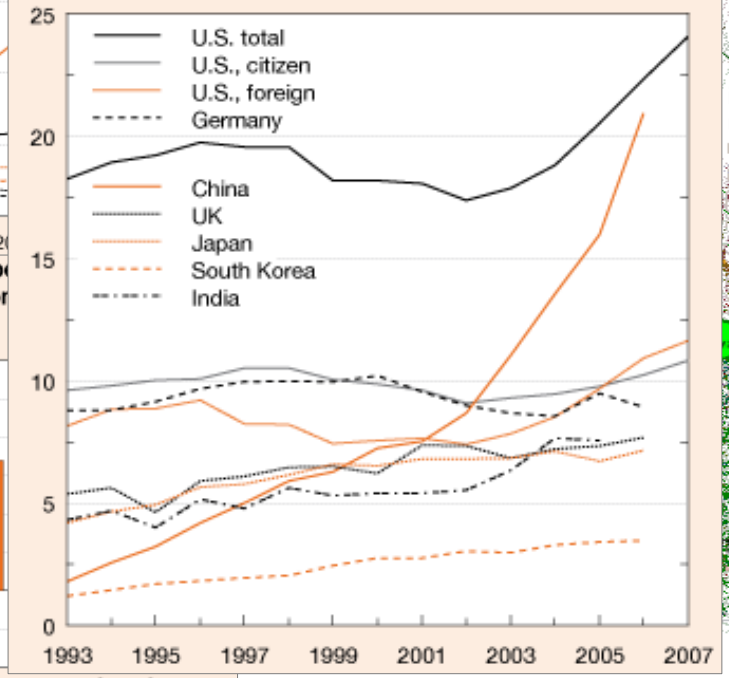
First university degrees in natural sciences and engineering, selected countries: 1998–2006

Thousands



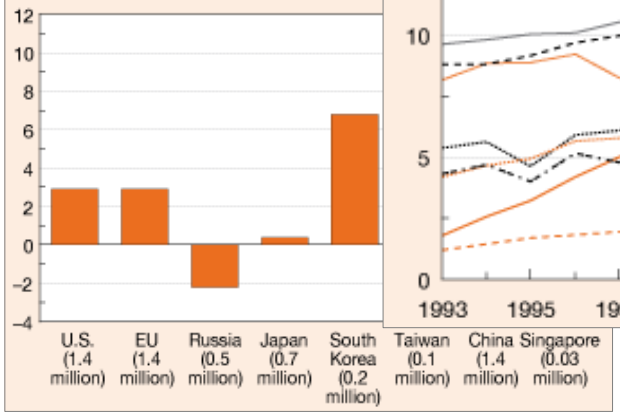
Doctoral degrees in natural sciences and engineering, selected countries: 1993–2007

Thousands

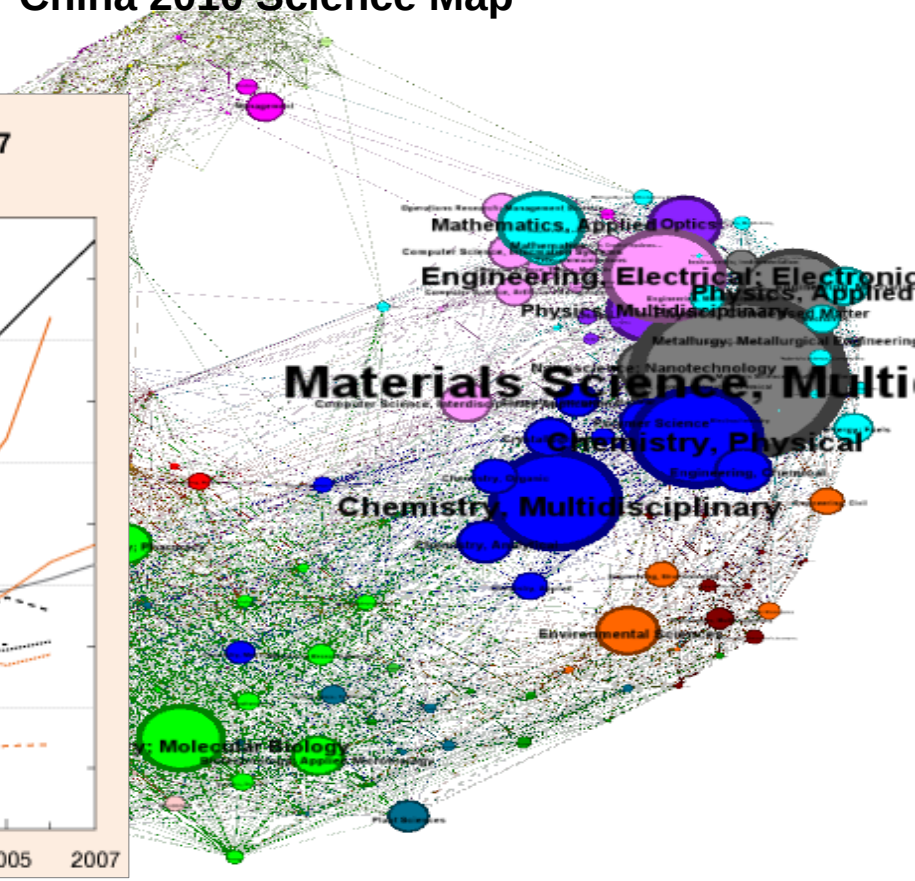


Average annual growth in numb… selected regions/countries/ecor…

Percent



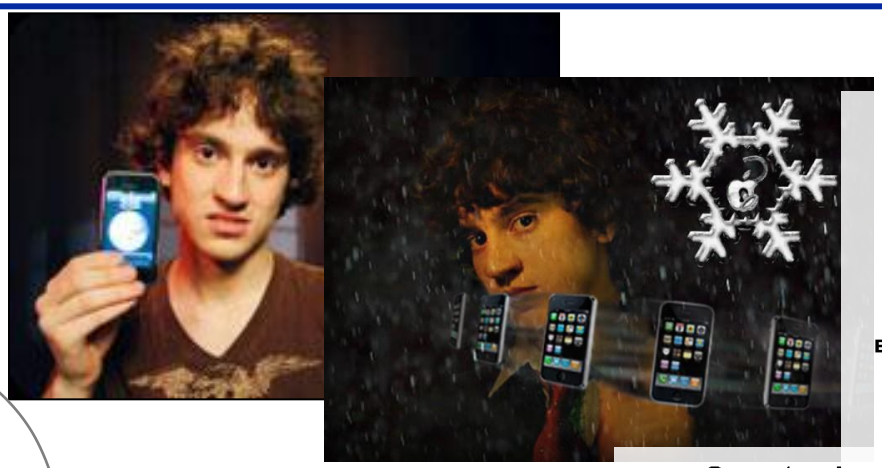
China 2010 Science Map

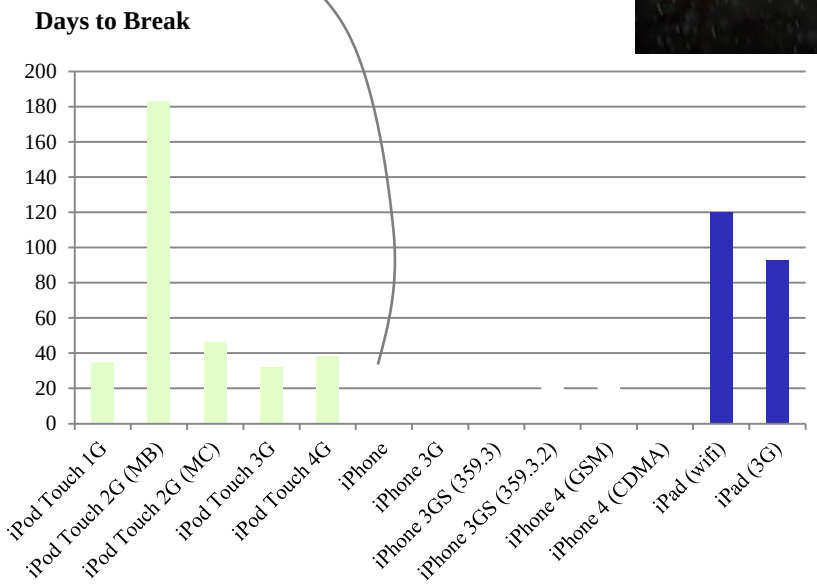


The Research Talent Base is Growing and Shifting at an Accelerating Rate

Information Agility

Apple and AT&T released the iPhone on 29 June in an exclusive agreement. Hotz spent ~500 hours working on his "summer project" and the hack was available in July.

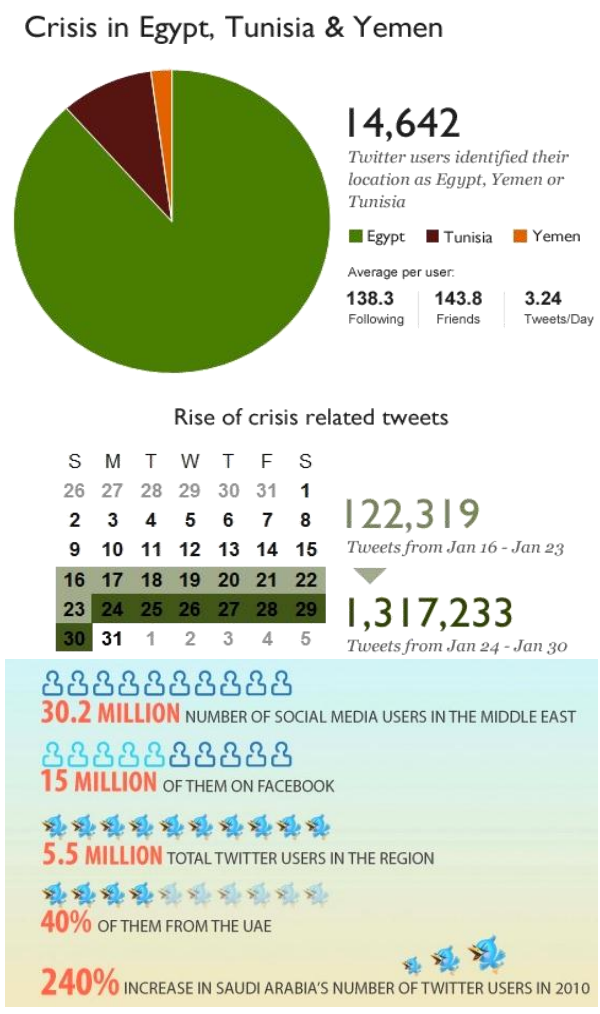


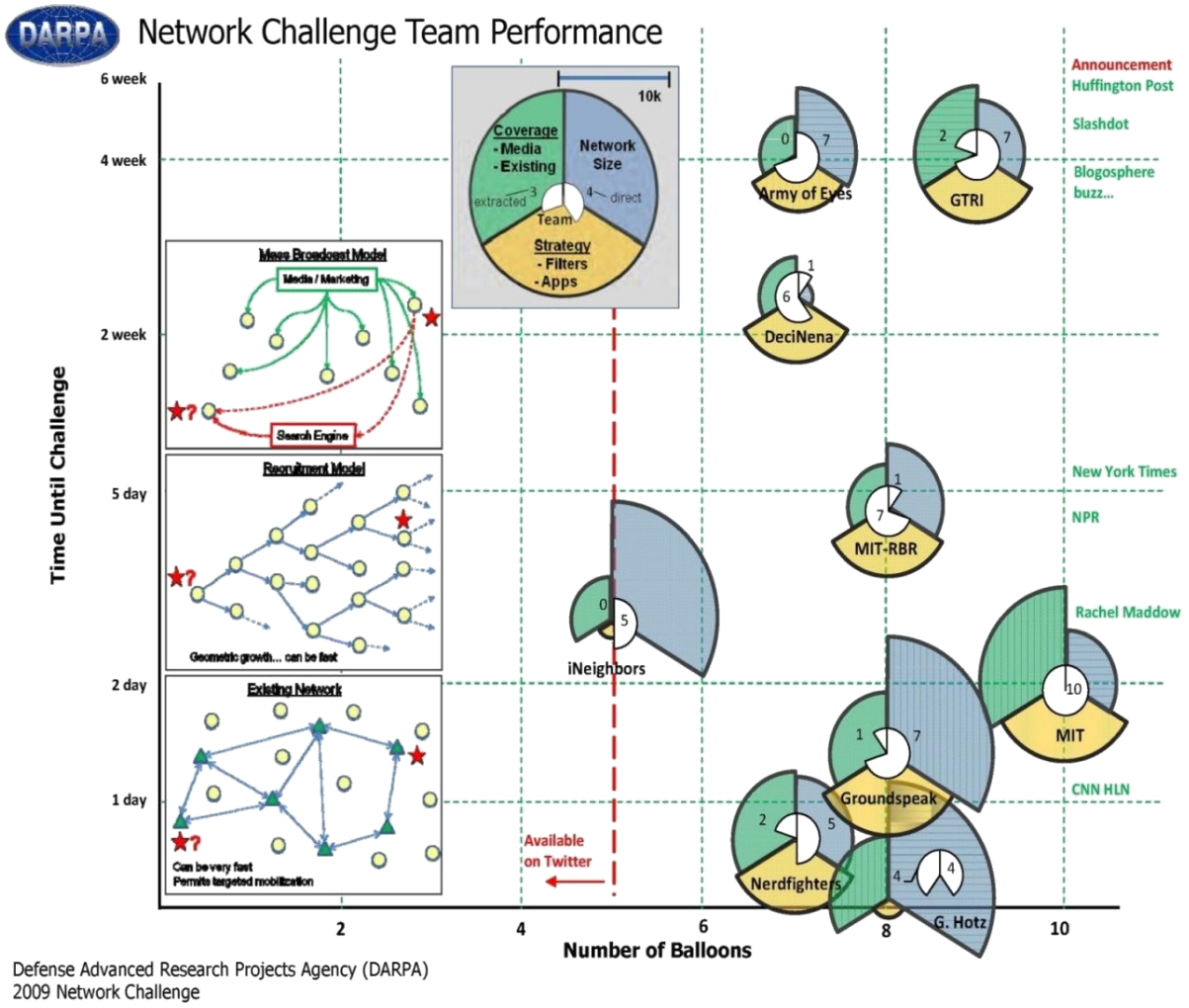


Today's adversaries are light and agile, and rapidly react and innovate in response to US actions.

This is the New Asymmetry—Victory Goes to the Agile and Innovative

Mass Collaboration





Defense Advanced Research Projects Agency (DARPA)
2009 Network Challenge

Ad-hoc Groups Can Quickly Solve (or Create) Massively-Complex Problems

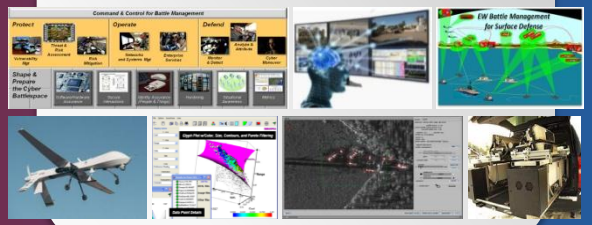
The Span of DoD R&E

Near Term

Specific potential adversary system performance

Mid Term

Strategic force development plans



Far Term

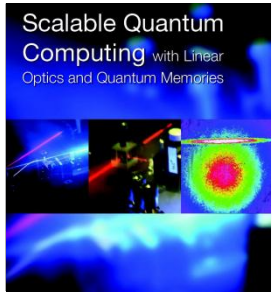
Understanding investment in research coupled with assessment of potential adversary capabilities

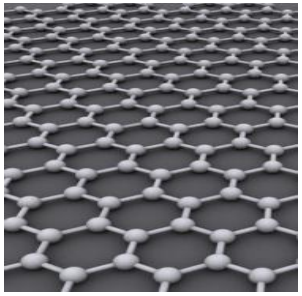
Prepare for an Uncertain Future

Basic Research Program

High Priority S&T areas for DoD

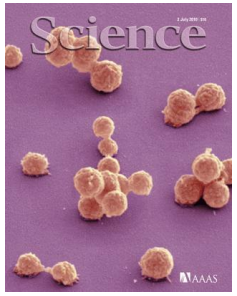
- Metamaterials and Plasmonics
- Quantum Information Science
- Cognitive Neuroscience
- Nanoscience and Nanoengineering
- Synthetic Biology
- Understanding Human and Social Behavior





Trends in basic research are identified and judged through a variety of interactions, including:

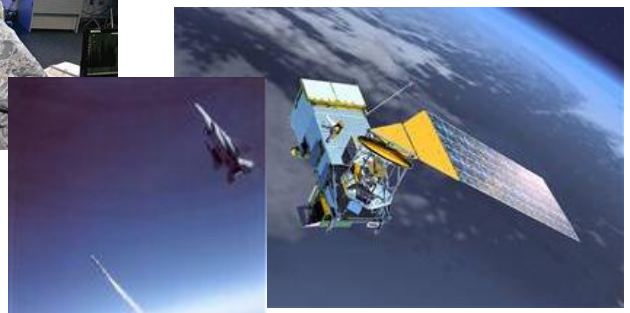
- Publications, university site visits, conference attendance
- Future Directions Workshops (identifying emerging areas for investment and International Centers of Excellence for collaborative opportunities)
- Engage expert panels (JASONs, National Academy of Sciences, etc…)

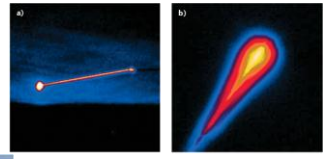


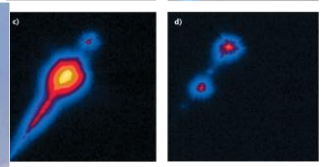
Understanding and Creating the Cutting Edge

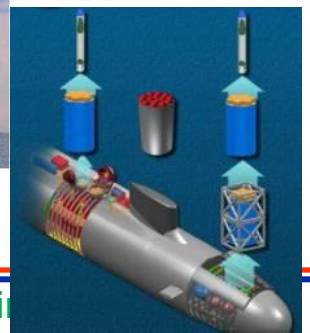
Anti-Access/ Area Denial
Current A2/AD Priorities

- Electronic Attack / Electronic Protection
- Cyber Operations
- Space / Counter Space
- Undersea Operations
- Counter Missile / Missile Defense
- Counter Integrated Air Defense Systems

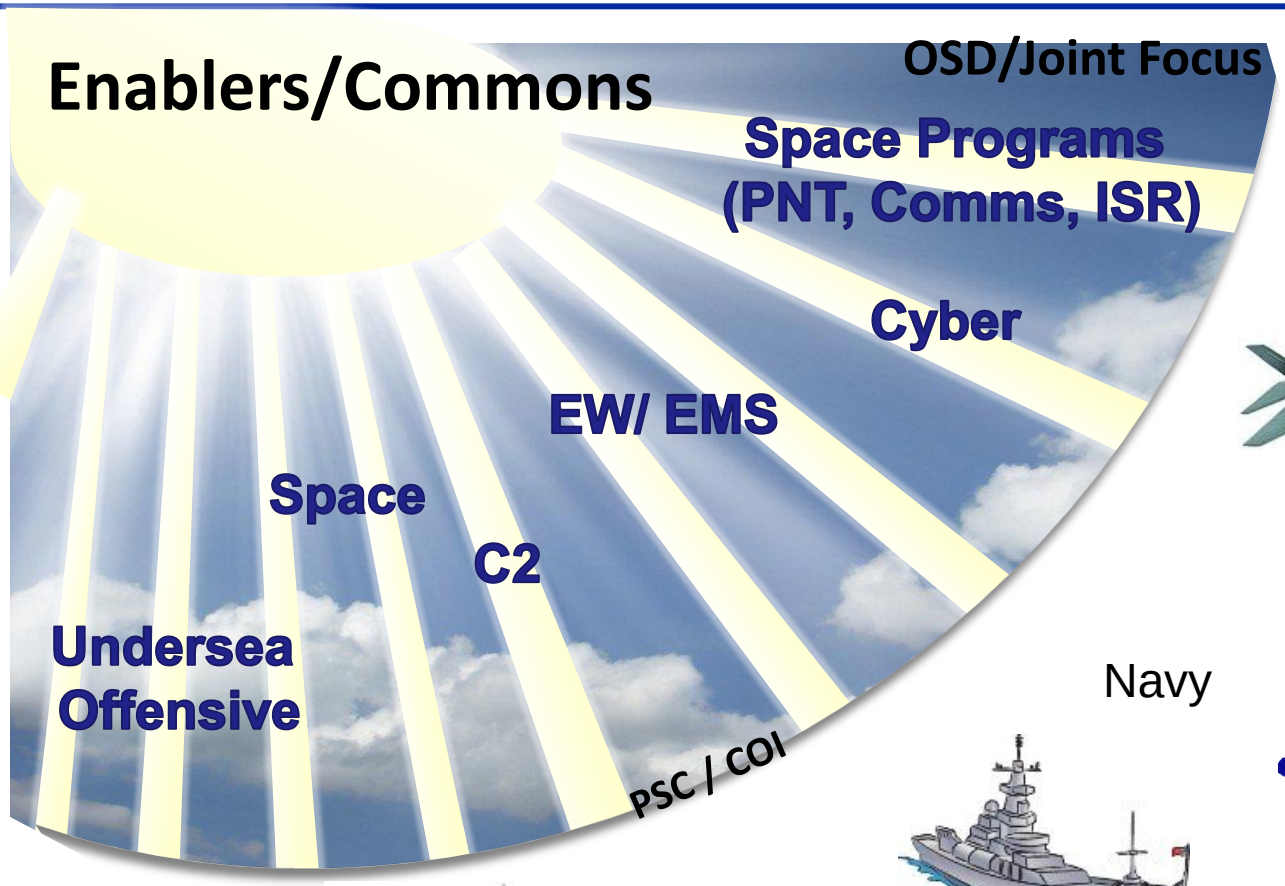








DoD S&T Budget Focus



Service Focus

Air Force

Navy

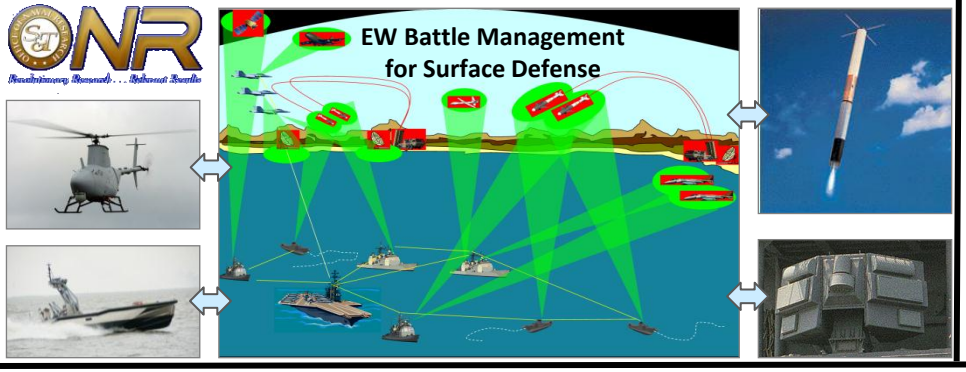
Army /
Marine Corps

Enabling Future Acquisition
- Developmental Prototyping

DoD S&T Complex Threats

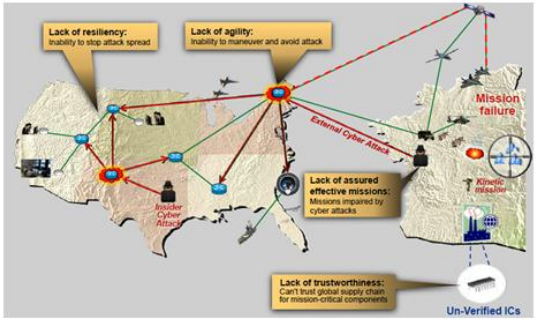
Electronic Warfare & Protection

- RF/Mixed Signal Component Technologies
- EO/IR Component Technologies
- Underlying technology enablers



Cyber Science and Technology

- Assuring Effective Missions
- Resilient Infrastructure Trust
- Cyber Experimentation & Measurement
- Agile Operations

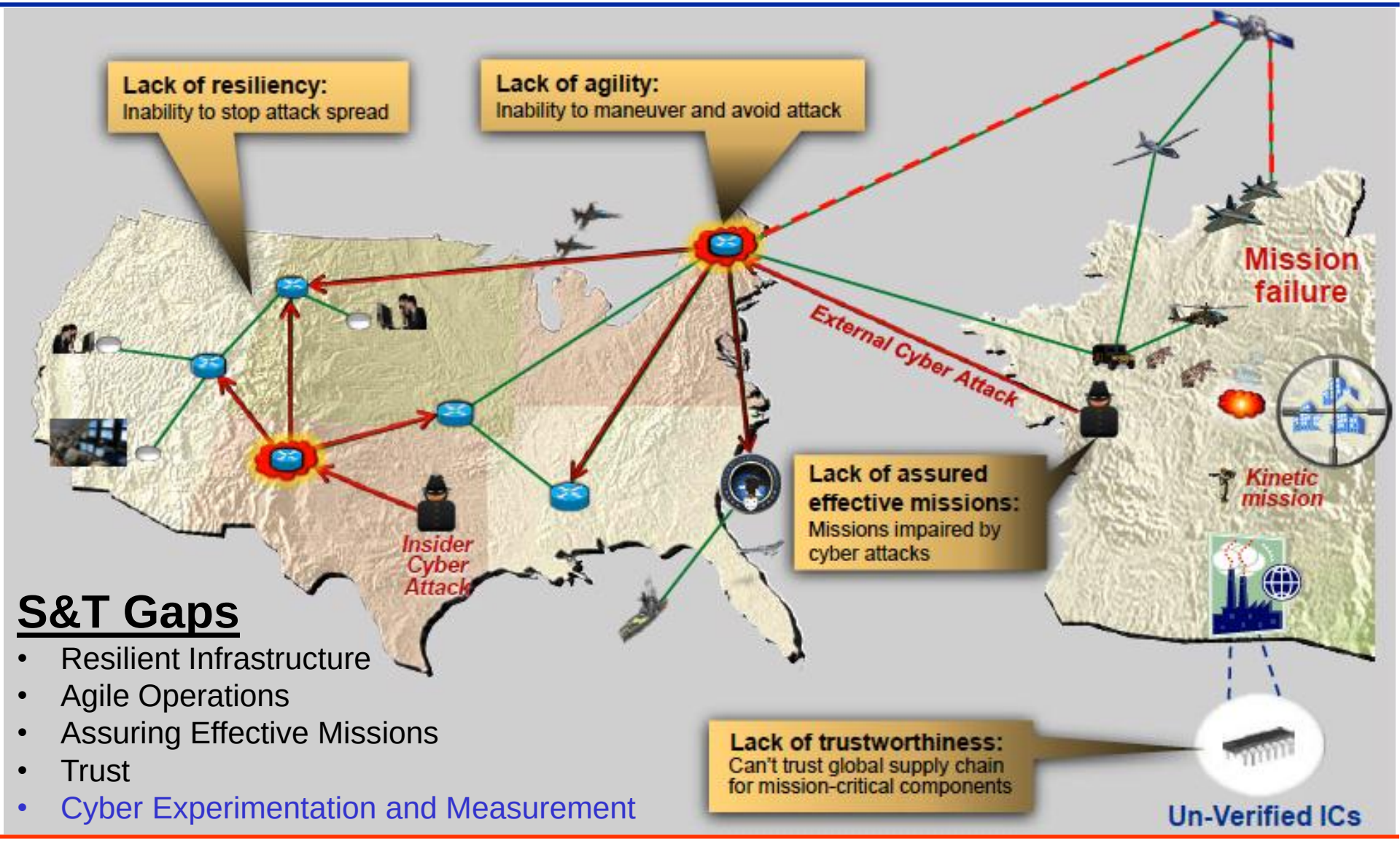


Counter Weapons of Mass Destruction

New concepts and technology for remote identification of nuclear, chemical, and biological material, and to assist in mitigation, containment, and attribution of the materials

- Broad Area Search
- Persistent Monitoring
- Tagging and Tracking

Cyber PSC – Problem Statement

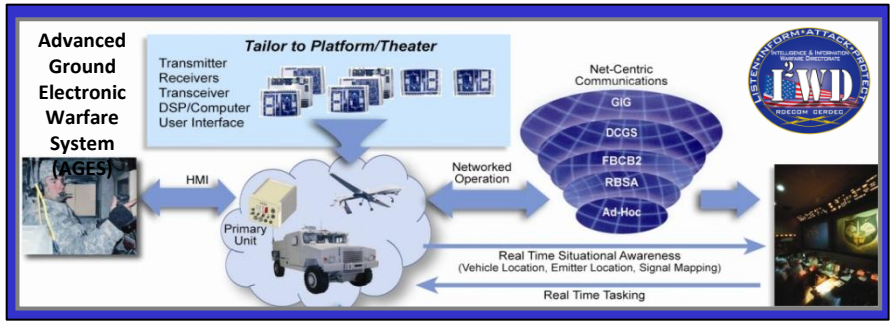


S&T Gaps

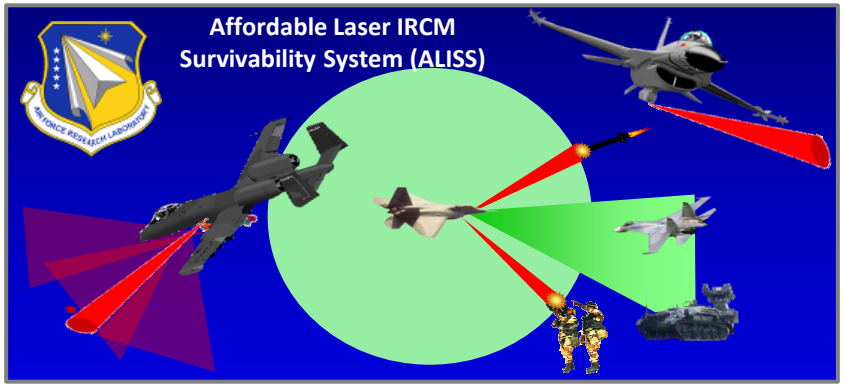
- Resilient Infrastructure
- Agile Operations
- Assuring Effective Missions
- Trust
- Cyber Experimentation and Measurement

Electronic Warfare Vision

Electromagnetic Spectrum Dominance

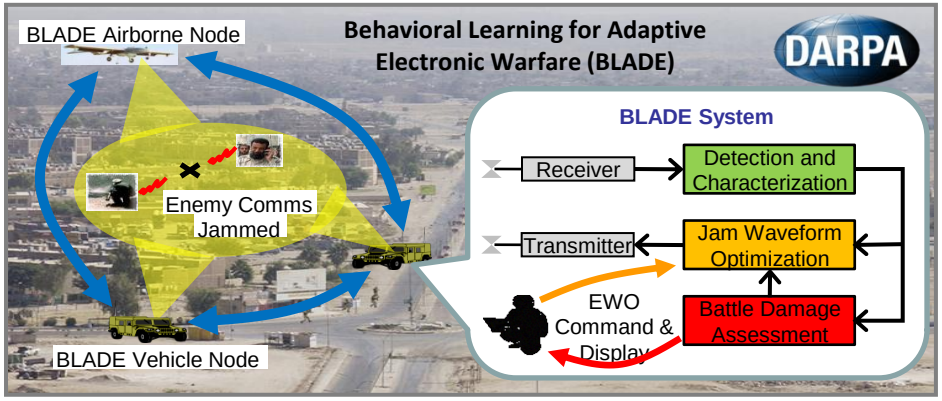


The Goal of Electronic Warfare is to Advantage U.S. and Coalition Force Operations by "Shaping" the Electromagnetic Spectrum (EMS)



S&T Gaps

- **RF/Mixed Signal Component Technologies**
  - Agile, high dynamic range receiver electronics
  - Agile, wideband transmitter electronics
  - Affordable/modular agile beam antennas
- **EO/IR Component Technologies**
  - Next generation multispectral IR Focal Plane Arrays (FPAs)
  - Multispectral, high power lasers
  - Multispectral optics & optical phase control
- **Underlying technology enablers**
  - Nitride semiconductor family (GaN/InN/AlN)
  - Ultra-precision clocks/oscillators (nsec → psec → fsec)



Defense Innovation Marketplace

defenseinnovationmarketplace.mil

Website devoted to making it easier for you to find out about DoD's S&T and Program Investments

Links to Relevant DoD Information

- S&T Planning Documents
- Key Briefs from Department Leaders
- Doing Business with DoD, e.g.
  - Broad Agency Announcements
  - Industry Day Announcements
  - Rapid Innovation Fund Information
  - Links to Army, AF, Navy Labs

www.defenseinnovationmarketplace.mil

Summary

- DoD S&T aligned to meet priorities for a 21st Century security environment
- DoD Strategic Framework….. lays the foundation for S&T commitments – 7 Priority S&T Areas
- Federal Deficit Reduction will impact; S&T remains steady priority
- Asia-Pacific rebalance is the foundation of our R&E strategy

Backup Slides